Remarks

Claim 4 was rejected as indefinite. Applicant requests reconsideration. The claim has been accordingly amended.

Claim 1 and 2 were rejected as anticipated Ho. Claims 3, 4, 5, 8, 9, 10, 11, 19, and 20 were rejected as unpatentable over Ho in view of prior art. Claims 6, 7, and 12-18 were objected to as having allowable subject matter based rejected base claims. Applicant requests reconsideration.

It is apparent that the examination has confused claimed features with features found in Ho. To aid the examination in realizing the patentable differences, the old term "decoding" in the independent claims has been replaced with "demodulating", and old "demodulating" term in the claims has been deleted, so that the examination does not continue to confuse unrelated elements of the invention and that of Ho.

The original claim 1 use the term "demodulating" to reference the downconversion process that occurs when demodulating a carrier upon reception. In the transmitter, the phase modulated signal is upconverted from a baseband frequency to a high RF frequency for efficient transmission. The transmitted signal is then downconverted during reception from the high RF frequency back down to the baseband frequency. This is very well known art. The reference to the baseband signal now only appears in dependent claim 3 along with the reference to up conversion and down

conversion. As such, claim 1 no longer uses the term "demodulation".

The original claim 2 used the term decoding, as in Viterbi decoding algorithms, are commonly used for "demodulating" a sequence of sampled inputs from the filtered continuous phase modulated signal. The primary reference, upon which the examiner relies, uses the term "Viterbi demodulator", which is a specific type of demodulator. Claim 2 and Ho now both use the term "demodulator" for that function, so that, a proper one-to-one comparison can now be clearly understood by the examiner, without confusion.

Claim 1 and 2 are considered together, as when combined, the original data stream, that is a bit data stream, in the transmitter is regenerated in the receiver as an estimate of the unprecoded data symbols, thereby completing the communication from the transmitter to the receiver. The bit data stream is processed in a series of process steps as claimed in claims 1 and 2, and as now compared, step by step with Ho, so as to remove the examination confusion and miscomparisons.

The bit data stream is a series of binary digits of zeros and ones. Both the present invention and Ho have an original bit data stream, such as b_k as used in Ho. The bit data stream is symbolized into a series of data symbols. In the case of NRZ 2-ary formatting, for example, the series of 0 and 1 bits are formatted into a series of +1 and -1 data symbols having a symbol set of +1 and -1, for 2-

ary modulation. For 4-ary modulation using NRZ mapping, two consecutive bits of 0 and 1 are formatted into a data symbol having the symbol set of +1, -1, +3, and -3. Hence, there is generated a sequence of M-ary data symbols. The M-ary symbols are then precoded in a particular and prescribed manner, as particularly stated in the precoding tables stated in the specification. The precoded symbol set is the same as in an unprecoded symbol set, that is, +1 and -1 for 2-ary modulation and +1, -1, +3 and -3 for 4-ary modulation. Ho performs the encoding and precoding functions in the "encoder", and Ho's c_k output is the precoder output. However, the particular precoding selected in Ho is used specifically to inject pilot symbols for channel estimation, and not to remove decoding after demodulation as does the present invention. The encoded data symbols c_k in Ho, along with the injected pilot symbols, are phase modulated using a BT product and transmitted as such.

Upon reception, the present invention uses a phase amplitude modulation (PAM) based filter bank to provide filtered signals having components that directly indicate the unprecoded, that is, the original data symbols. In contrast, Ho uses an anti-aliasing filter to remove noise. The filter output in Ho does not have signal component that directly indicate the unprecoded data symbols b_k . There is no similarity in these two filtering functions because the respective filters serve two different respective purposes. Although both are referred to as filters, the actual filtering performed and the purposes are clearly unrelated.

As such, the filter outputs in the present invention are of significant value per se, in that, the filter outputs could be used for directly generating an estimate of the unprecoded data symbols using one of many forms of Viterbi demodulation with various levels of complexity and resulting performance. With a sufficiently large BT product, the output of a signal filter, for example, the principal filter, can be used to directly provide reliable estimates of the unprecoded data stream.

The filter output is sampled at the symbol time boundaries in both Ho and the present invention. The demodulator in the present invention DIRECTLY provides the estimated unprecoded symbols, that is, the uncoded data symbols, whereas the demodulator in Ho only provides an estimate of the encoded data symbols, which must then be DECODED to arrive at the estimate of the uncoded data symbols. As such, the examination must now recognize that Ho does not use a precoder for eliminating the decoding step in the receiver, as does the present invention. Clearly, the invention is directly contrary to Ho's teachings. Ho does not address the very problem that the present invention solves. Ho cannot possibly use a precoder as in the present invention to solve the problem of avoiding the final decoding step in the receiver.

Ho does teach the use of a Viterbi demodulator, but such demodulators have long been used. In the case of small BT products and high-order M-ary modulation, Viterbi demodulation is often used to mitigate the degrading effect of intersymbol interference, that is typically shown in eye diagrams having poorly defined detection

levels in the constellation signal space. However, and as an example, in the case of 2-ary communications with a relatively large BT product and where the output of the principal filter is sampled at symbol boundaries, a simple comparison of the sampled principal filter outputs to a zero threshold value could be used as a demodulator of the unprecoded data symbols. That is, the demodulator could be a simple thresholding device. The choice of demodulator addresses the selected BT value and system BER performance in the presence of channel noise, and is not determinative as to the innovative structure and functions of the invention. Hence, claim 1 does not specify the exact type of demodulator used, as the focus of the invention is directed to the use of a precoder for use with a corresponding filter providing a phase indicating the unprecoded data symbol, so that, post-demodulation decoding is not needed.

The present invention precodes data in a continuous phase modulator in combination with and matched to a filter for providing a filtered output having a phase that directly relates to the unprecoded data, so as to avoid the need for decoding in the receiver. Ho's use of precoding for injecting pilot symbols is irrelevant. Ho's use of an anti-aliasing filter is irrelevant, as well. But, Ho is a good prior art example of demonstrating the need for decoding in the receiver after demodulation, as Ho never addresses the problem of eliminating this decoding, as Ho teaches that this decoding "undoes" the encoding that was done in the modulator, and Ho specifically teaches that "The output of the demodulator 18, is sent to a decoder 20, which undoes the mapping

done by the encoder 10." The object of the precoding in the present invention is to remove the need for decoding after the demodulator, and as such, the present invention proceeds directly contrary to Ho, as Ho is strong evidence of nonobviousness.

The cited references do not teach precoding in a continuous phase modulator for recovering from a matched filter a data stream, without post demodulation decoding. Allowance of the claims is requested.

Respectfully Submitted

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CERTIFICATE OF MAILING

I, hereby certify that this correspondence is being deposited in the United States Postal Service in an envelope with First Class full postal prepaid thereon addressed to: Commissioner of Patent, P.O. Box 1450 Alexandria, VA 22313-1450.

Date: June 25,2003

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